Entrained Flow Reactor Study of K-Capture by Solid Additives - DTU Orbit (09/11/2017)

Entrained Flow Reactor Study of K-Capture by Solid Additives

A method to simulate the reaction between gaseous K-species and solid additives, at suspension fired conditions has been developed, using an entrained flow reactor (EFR). A water slurry containing solid additives (kaolin or coal fly ash) and KCl, is injected into the EFR and the solid products are collected from the cyclone and filter. The K-capture reaction is evaluated by determining the fraction of water-insoluble K in the products. The results showed that KCl can effectively be captured by kaolin and coal fly ash, forming water-insoluble K-aluminosilicates. The amount of K, captured per gram of additives, rose when increasing the molar ratio of K/(Al+Si) in the reactants. A change of the reaction temperature, from 1100 °C to 1450 °C, did not significantly influence the extent of the reaction, which is in contradiction to the trend observed in previous fixed-bed reactor studies. The method using the EFR, developed in this study, will be applied for further studies on the reaction of different additives and alkali species.

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